

WHAT IS CLAIMED IS:

1. A chip for detecting DNA,
wherein a double strands formed by hybridization of signaling DNA
5 and probe DNA is fixed to electrodes, and the signaling DNA and the probe
DNA are complementary each other and either of the DNAs is also
complementary to a base sequence of a target DNA, and the
complementarities between the target DNA and the signaling DNA and the
probe DNA are different, wherein the signaling DNA is labeled with an
10 electrochemically active compound.

2. The chip for detecting DNA as claimed in claim 1,
wherein said electrode of the chip for detecting DNA is an array form
having at least one electrode.

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3. The chip for detecting DNA as claimed in claim 1,
wherein the chip for detecting DNA is made by fixing the probe DNA
on the electrode by a method for forming a self-assembled monolayer,
immersing said electrode to the signaling DNA solution, and deriving
20 hybridization reaction by increasing temperature of the solution up to the
melting point and decreasing it so that a double strand is formed.

4. The chip for detecting DNA as claimed in claim 1,
wherein the chip for detecting DNA is made by drawing hybridization

reaction by increasing temperature of a solution containing same amounts of the probe DNA and the signaling DNA up to the melting point and cooling down gradually, so that a double strand is formed, and fixing the double strand on an electrode by a method for forming self-assembled monolayer.

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5. The chip for detecting DNA as claimed in claim 1,
wherein complementarity between base sequences of the probe DNA and the target DNA is higher than that between base sequences of the probe DNA and the signaling DNA.

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6. The chip for detecting DNA as claimed in claim 1,
wherein complementarity between base sequences of the signaling DNA and the target DNA is higher than that between base sequences of the probe DNA and the signaling DNA.

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7. The chip for detecting DNA as claimed in claim 1,
wherein the electrically active material that is bonded to the signaling DNA is at least one selected from a group consisting of polypyridine or polyphenanthroline complex compound of ferrocene, rucenium, or osmium,
20 viologen, hydroquinone, anthraquinone, and pyrrolo quinoline quinone.

8. The chip for detecting DNA as claimed in claim 1,
wherein the chip for detecting DNA is prepared by fixing at least two double strands that have been formed by using at least two probe DNAs and

signaling DNAs corresponding to those probe DNAs to electrodes of electrode array having at least two electrodes arranged so that simultaneous multiple DNA detection can be performed.

5 9. A method for detecting DNA, comprising:

 preparing a chip for detecting DNA, wherein a double strands formed by hybridization of signaling DNA and probe DNA is fixed to electrodes, and the signaling DNA and the probe DNA are complementary each other and either of the DNAs is also complementary to a base sequence of a target DNA,
10 and the complementarities between the target DNA and the signaling DNA and the probe DNA are different, wherein the signaling DNA is labeled with an electrochemically active compound;

 deriving competitive reaction among the probe DNA, the signaling DNA, and the target DNA by putting a solution of the target DNA to the chip
15 for detecting DNA; and

 detecting amount and type of the target DNA by measuring a change of the electrochemical signal of the signaling DNA before and after the competitive reaction.

20 10. The method for detecting DNA as claimed in claim 9,

 in said step for deriving competitive reaction, heating electrode of the chip near to the melting temperature of a double strand formed by the signaling DNA and the probe DNA and cooling is repeated.

11. The method for detecting DNA as claimed in claim 9,
wherein the amount of the target DNA is quantified by measuring
change of electrochemical signal before and after the competitive reaction of
the signaling DNA.

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12. The method for detecting DNA as claimed in claim 9,
wherein the type of the target DNA is determined by performing
competitive reaction between a double strand and an unknown target DNA and
measuring electrochemical signal produced from the competitive reaction, on
10 a chip for DNA detection having electrode array of at least one electrode
formed by fixing several double strands of the probe DNAs and the signaling
DNAs corresponding to several types of expected base sequence of target
DNAs.

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13. The method for detecting DNA as claimed in claim 9,
wherein multiple DNA detection is performed by using the chip for
detecting DNA that is formed by fixing at least two double strands of DNAs
produced from at least two different probe DNAs and signaling DNAs
corresponding to the probe DNAs to each electrode of an electrode array
20 having at least two electrodes arranged.